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TITLE

Device for personal safety on scaffolds

TECHNICAL FIELD

The present invention relates to a device for personal safety on scaffolds according to the precharacterizing clause of Patent Claim 1 below.

BACKGROUND ART

In assembled scaffolds, there are means for personal protection against falling in the form of fixed guard rails which are coupled between the scaffold uprights in a scaffold. At the same time, these form stabilizing parts of the scaffold and hold the scaffold uprights in an erect position.

When scaffolds are being erected and dismantled, scaffold erectors often work on the parts of the scaffold which do not have guard rails. In order to provide protection against falling, use is made of safety harnesses with lifelines which, however, limit the freedom of movement of the person. Safe anchoring points must be selected and moved as the work progresses.

Attempts have been made to arrange movable guard rails for erecting and dismantling operations (see for example GB 1 528 220), but these have proved difficult to handle for scaffold erectors.

DISCLOSURE OF INVENTION

The object of the present invention is to produce a device in which extra guard rails can be handled and moved with great safety.

The said object is achieved by means of the device according to the present invention, the characteristics of which emerge from Patent Claim 1 below.

LIST OF FIGURES

The invention will be described in greater detail below by means of a few illustrative embodiments with reference to accompanying drawings in which

Fig. 1	shows an embodiment of the safety device according to the invention in a perspective view at an angle from the front, mounted in a lower safety position on a scaffold;
Fig. 2	shows the safety device in a position during movement between an upper and a lower safety position;
Fig. 3	shows the safety device in an upper safety position;
Figs 4, 5 and 6	show different views of a safety upright forming part of the safety device according to the invention;
Figs 7 and 8	show partial side views of a safety upright with an actuating device and a coupling device which can be adjusted by the latter in on the one hand locking position and on the other hand releasing position, and
Fig. 9	shows the safety upright from above.

PREFERRED EMBODIMENT

Figs 1-3 show the construction in principle of a safety device 1 for personal safety on scaffolds 2. The safety device 1 is shown by somewhat heavier lines, while the scaffold is shown by somewhat lighter lines in order that the safety device emerges more clearly. The scaffold comprises a number of scaffold uprights, in the example shown according to Fig. 1 four uprights 3, 4, 5, 6, which in pairs support between them at least one working platform 7 which can be positioned at different heights in order to make work possible at different heights along, for example, the façade of a house construction. The platform or platforms is or are supported between the uprights arranged in pairs by virtue of, for example, having hooks which are coupled to

transverse, lying, suitably horizontal scaffold elements 66-73 which extend between the uprights 3 and 4 and, respectively, 5 and 6.

The scaffold also includes fixed scaffold rails 64, 65 which are accordingly arranged so that each scaffold rail is arranged between the two outermost uprights 3 and 6 in order to afford protection in the outward direction, for example at a suitable height above a working platform 7. These fixed rails can be fastened directly to the scaffold uprights 3, 6 or to the transverse scaffold elements.

Erection of the scaffold proceeds from the bottom, as the uprights 3-6 are to rest with their lower ends 14, 15 against a surface, for example the ground or a floor. Erection is started by lower sections of at least two uprights, for example 3 and 4, being held in an erect position, standing on the surface, after which two connecting elements, a scaffold rail and if appropriate the working platform 7 and diagonal elements (not shown) as well are mounted, at least the lower sections of the four uprights then being held erect. As erection continues above the working platform 7, heights are reached which involve risks of accident. For example, the scaffold may be intended to have such a height that each upright consists of several sections which are joined to one another, after which scaffold rails and working platforms located above are to be mounted.

In order to safeguard personnel when the scaffold is being erected and dismantled, a safety device 1 according to the invention has therefore been produced, which is adapted to be moved upwardly or downwardly as the scaffold is being erected and, respectively, dismantled. To this end, the safety device 1 (see Fig. 1) consists of at least one, in the example two safety uprights 18, 19 which are each provided with one or more coupling devices 20, 21, 22, 23 for releasable coupling-together with the scaffold. In the example shown, each safety upright 18, 19 is provided with two coupling

devices arranged at a distance from one another for a coupling-together which ensures that the safety uprights extend essentially parallel to the scaffold uprights. The safety uprights 18, 19 support between them at least one guard rail 24 which, in the example shown, consists of an upper rail element 25 and a lower rail element 26. The two rail elements 25, 26 are connected at their ends 27, 28, 29, 30 to the safety uprights 18, 19; to be precise, in the example they are connected to the safety uprights in an articulated manner, suitably adjacent to the upper end of the safety uprights so that the upper rail element is located close to the respective upper ends 31, 32, while the lower rail element 26 is located a little way below at a distance which is adapted for the protection function concerned.

For each of the safety uprights 18, 19, the safety device has an actuating device 33, 34 with at least at one end 35, 36 of each safety upright, in the example shown both ends 35-38, actuating means 39, 40, 41, 42 for adjusting the coupling devices 20-23 between releasing position and coupling position. In the coupling position, the coupling devices are adapted on the one hand to secure the safety uprights 18, 19 in their parallel position and on the other hand to maintain the selected vertical position of the safety uprights, that is to say to lock them relative to movements in the axial direction of the uprights. To this end, the safety uprights receive, through the coupling devices, support against bearing surfaces in the scaffold, in the example shown the lying scaffold elements 66-73, that is to say horizontal tubes, in the example one end side element 10, 12 for each coupling device 20-23.

Fig. 1 also shows that the end of each rail element 25, 26 is connected in an articulated manner to its safety upright 18, 19 by means of a fastening arrangement in the form of an articulation arrangement 43 which makes possible relative articulated movement of the rail element about an axis 44 which extends essentially at right angles relative to on the one hand the

longitudinal axis of its safety upright and on the other hand the longitudinal axis of the rail element. The rail elements 25, 26 are therefore supported at their ends by the safety uprights 18, 19 via the articulation arrangement. The articulation arrangements can be connected firmly to the uprights but can alternatively be displaceable between different vertical positions along the uprights and lockable on these in the selected vertical position.

Figs 4, 5 and 6 show a safety upright 18 separately from different directions with the two coupling devices 20, 21, which are therefore located at a distance axially from the guard rail 24, and with the associated actuating device 33, with its actuating means 39, 41, one at each end 35, 37 of the safety upright. One of the coupling devices 20 is shown on larger scale in Figs 7-9 and consists in the example shown of a gripping hook 45 with a downwardly open gripping space 46 which is designed and dimensioned to receive a lying scaffold element 72 in the scaffold, so that the safety upright 18 rests on the lying scaffold element by means of the coupling device 20. A cross section of the scaffold element is indicated by broken lines. The gripping space 46 is provided with a gripping opening 47, facing in the direction away from the guard rail 24, that is to say downwards. The coupling device 20 has a locking means 48 which is adjustable between a locking position for the coupling device, which is shown in Fig. 7, and a releasing position which is shown in Fig. 8. In the example shown, the locking means consists of a locking bolt which is anchored movably in the gripping hook 45 and can be displaced into and out of the gripping opening 47. In locking position, the effective downwardly facing gripping opening 47 shrinks to a dimension smaller than the diameter of the scaffold element 10. The locking bolt 48 is advantageously designed with a locking surface which, together with the concave inner surface 50 of the gripping hook, is adapted to afford good contact with and stable support against the outer surface of the scaffold element which is cylindrical in the example shown. In this connection, the locking bolt can be pushed forward, for example by means of

a diagrammatically illustrated spring mechanism 51, so that play-free contact is obtained between the support surfaces. In the releasing position according to Fig. 8, it is possible to pull the gripping hooks 45 of the coupling devices 20 away from the scaffold element so that the gripping hooks can be taken out of coupling position and removed from the scaffold element 10 in order to be moved to a new safety position or for dismantling. It is important that stable support is obtained in the releasing position as well in order to hold the safety device in a selected vertical position.

Figs 7-9 also show the actuating device 33 of the coupling devices. Accordingly, this includes the actuating means 39-42 which are located at the ends of each safety upright 18, 19. In the example shown, each actuating means consists of a handle which is mounted rotatably in the upright and, in the example shown, arranged in a rotationally fixed manner at the upper and the lower end of a turning bar 52 which is mounted rotatably coaxially in each safety upright and extends all the way through the safety upright or at least as far as the coupling devices. Arranged at each coupling device is a movement-transmitting link mechanism 55 which is adapted to convert the actuating movement of each actuating means 39, 41 into an adjusting movement of the locking means 48 in the associated coupling device 20 between the locking position according to Fig. 7 and the releasing position according to Fig. 8. In the example shown, the movement-transmitting link arm mechanism consists of a link arm 56 and a push rod 57. The link arm 56 is connected to the turning bar 52 in a rotationally fixed manner, and the push rod 57 is at its one end connected in an articulated manner to the link arm and at its other end connected to the locking means so as, by the rotary movement, to bring about a longitudinal displacement movement of the locking means counter to the action of the spring mechanism 51, for example a helical spring (compression spring) which is restrained between the locking means and a fixed surface in the coupling device and is threaded onto the push rod and tends to hold the locking means 48 in locking position.

By means of a slot in the articulation point, the push rod 57 and thus the locking bolt 48 can perform a pure longitudinal displacement movement. Alternatively, the locking means can be pivotable.

The coupling devices are suitably arranged firmly on the safety uprights, in the example shown by virtue of the gripping hook 45 merging with a short arm 58 with a hole in one of its ends. The hole is dimensioned and shaped so that the safety upright 18 will pass through it. Firm connection can take place by means of a welded joint, a screwed joint or the like.

In the example shown, the guard rail 24 in the safety device is continuously extendable, for example by virtue of each rail element 25, 26 being telescopically extendable and consisting of, for example, an outer tube 59 and an inner tube 60 which can be inserted telescopically into the outer tube. More than two tubes can be present in order to obtain a greater adjustment range. The length-adjustability means that one and the same safety device can be used for different lengths of working platform 7, that is to say different distances between the scaffold uprights 18, 19, and makes possible the successive movement of one safety upright 18, 19 at a time in the safety device as the scaffold is being erected or dismantled.

The use of the safety device according to the invention during erection of a scaffold will now be described below.

As mentioned previously, the erection of the scaffold proceeds from the bottom, with the erection of a number of scaffold uprights and the mounting initially of a bracing scaffold element, which can be mounted at a low height, on the whole by personnel on the ground. In the example, fixed scaffold rails 64, 65 in the form of lying, longitudinal scaffold elements are mounted between the two front scaffold uprights 3, 6, after the transverse, lying scaffold elements 66-73 which are coupled between the front scaffold

uprights 3, 6 on one side and the rear scaffold uprights 4, 5 on the other side. The first working platform 7 can then be positioned at a suitable height by its hooks 74, 75, which grip around the transverse scaffold elements 66, 70. Depending on the height of the final scaffold, use is made of a number of sections for each scaffold upright, starting with lower sections and then gradually joining on additional sections as the scaffold is erected. Joining-on is advantageously carried out so that all sections of the scaffold uprights are arranged along one and the same longitudinal axis.

Before personnel step onto the working platform 7, the safety device is mounted so that the associated guard rail 24 will be located at a suitable safety height above the working platform (see Fig. 1). Mounting is suitably carried out by two people, it being possible for the safety device to be assembled on the ground. For transport purposes, the safety uprights 18, 19 are suitably disconnected from the guard rail 24 at the articulation arrangement 43. In the storage and transport state, the safety device according to the example shown thus forms essentially a number of parallel tubes. The mounted safety device 1 is positioned with its two safety uprights 18, 19 on the inside of the scaffold uprights 3, 6 adjacent to which the safety uprights are to be arranged, in the example the outer uprights. This is carried out at such a height that, as mentioned above, the guard rail 24 affords effective protection during subsequent scaffold erection. Furthermore, the coupling devices 20, 21, 22, 23 are adjusted to releasing position, after which their coupling hooks are each made to grip around a respective lying scaffold element 66, 67, 70, 71 so as to be supported by the latter by resting on the associated scaffold element. In this connection, the mounted safety upright 19 is held in a stable support position with a fixed vertical position. Then, the nearest accessible actuating means, for example the lower actuating means 41, 42, is activated for adjustment to locking position. Activation takes place under the action of the spring mechanism 51, which ensures that the locking position is maintained during use of the safety

device. By virtue of the rail elements 25, 26 of the guard rail 24 being connected in an articulated manner at their ends to the safety uprights and moreover being extendable, erection does not have to take place entirely synchronously on the two sides, but can take place individually, the rail elements being, on account of their adjustable length, adaptable to the distance concerned between the scaffold uprights. The coupling devices are advantageously secured on the associated scaffold uprights in such a way that the structure is also secured against movements in the lateral direction. This is achieved either by high friction in the support surfaces or by the locking means 48 not only locking but clamping or firmly gripping the scaffold element in the recess 50.

In its first safety position according to Fig. 1, the safety device 1 can be mounted either from ground level or from another safe working position, for example from what is known as a skylift, by virtue of actuating means 39-42 being arranged at both ends of the safety uprights 18, 19. With the safety device in the position shown, personnel can very safely remain on the working platform 7 in order to continue the erection of the scaffold. For example, further sections of scaffold uprights can be added, after which permanent scaffold rails can be mounted inside the guard rail 24 and a working platform (not shown) located above can be mounted.

Before the scaffold is erected further upwards, the safety device 1 according to the invention is moved further upwards. In this connection, one safety upright 19 is first freed by adjustment (in the example rotation) of one of the actuating means 40, 42 at the ends of the safety upright, suitably the lower end. A scaffold erector can in this connection activate the actuating means 42 for release, after which he lifts the safety upright 19 upwards along the scaffold upright 6 (see Fig. 2). This is possible by virtue of the rail elements 25, 26 being articulated at their fastening points and telescopically extendable, as can be seen from Fig. 2. When the raised end of the guard

rail 24 has reached the desired height, the safety upright 19 is coupled to the scaffold close to the scaffold upright 6. The two coupling devices 22, 23 are in this connection each made to grip around a respective lying scaffold element, in this case two transverse elements 68, 69 which have the same mutual interspace as the gripping hooks on the safety upright. Then, one of the actuating means 40, 42, suitably the lower actuating means 42, is activated (in the example released) for changing the coupling devices 22, 23 over to coupled or locked position. In this connection, the safety upright 19 obtains vertical support against an element in the scaffold. Support in the lateral direction is obtained by friction in the gripping hooks and support against the scaffold upright. Special stop means on the lying scaffold elements are also possible. The other side of the safety device 1 can then be moved up by the left safety upright 18 being released by means of, for example, the actuating means 41, after which, for example, a person standing to the left on the working platform 7 can lift the safety upright 18 up to the desired position, suitably with the guard rail 24 essentially horizontal (see Fig. 3), after which the coupling devices 20, 21 are adjusted to coupling position. It is conceivable for a single scaffold erector to do this because one safety upright is handled at a time.

The safety device 1 is then in the safety position according to Fig. 3, and scaffold erectors can then very safely erect the scaffold further if so required. In this connection, further scaffold uprights can be added on top of the four scaffold uprights shown, and a permanent scaffold rail can be mounted inside the guard rail of the safety device.

When the scaffold is erected, the safety device can in principle remain in its top position and either afford supplementary protection or if appropriate replace the top guard rail.

When the scaffold is dismantled, the procedure is in principle the same as described above, but in reverse order, as the various elements of the scaffold are taken down starting from the top.

The invention is not limited to illustrative embodiments described above and shown in the drawings but can be varied within the scope of the patent claims below. For example, it may in some cases be sufficient to have one coupling device on each safety upright. If this is given a greater extent in the vertical direction, a torsion-resistant coupling can still be obtained. In principle, it is conceivable for the fastening devices for the guard rail 24 to be fixed, that is to say not articulated, and for the rail elements to be unextendable and adapted in their length to the distance between the scaffold uprights 3, 6. For example, the safety device can permanently have the appearance the safety device in Figs 1 and 3 has.

In the case of a safety device with a guard rail without articulations, it is particularly suitable if such an embodiment is intended for the end sides, that is to say the short sides, of the scaffold and can still advantageously be coupled to the lying, transverse scaffold elements on the end sides. In this connection, it is conceivable for the safety device to be provided with a single safety upright, the guard rail projecting laterally from the safety upright and therefore being connected to the safety upright without articulation. Such end side safety devices can moreover be combined with articulated safety devices according to the example shown, it then being possible therefore for the guard rail for the long sides to be fastened to a safety upright shared with a short side. It is also conceivable for only one of the coupling devices to be lockable, in the case of an articulated construction one lock in each safety upright, in the case of a rigid construction it is in principle sufficient for one safety upright to be locked. Furthermore, the coupling devices can be coupled to other parts of the scaffold, for example one or two at a time of the longitudinal lying (horizontal) scaffold elements.

Alternatively, the safety uprights can be coupled to the coupling means of the scaffold uprights, which may be a cup running around, or a bracket or plate with a hole for hooking in gripping elements. A combination of gripping hooks for support against lying elements and hooks for hooking firmly to scaffold uprights is also conceivable. It is then sufficient for one type of hooks to be lockable. Instead of an actuating handle and turning bar, another actuating device can be selected, for example a pull/push rod or wire which is pulled in the axial direction, the actuating means then being a pull/push means. A common feature of the various coupling devices is that they rest on an upwardly facing portion of the scaffold in order that the safety upright or safety uprights will be secured safely to the scaffold in coupling position and released for movement of the safety device.